Title of project:

The Environmental Impact Quotient: A pesticide decision tool

Project leaders:
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Abstract:
Determining the impact of pesticides on the environment, workers and consumers can be a complex matter, but NY State's IPM program has been making it easier for growers to decide which pesticide to use for over twenty years. The Environmental Impact Quotient (EIQ) is the formula that simplifies the process. Devised and maintained by the NYS IPM program it is used by growers and crop advisors from NY, the US and abroad. EIQ users enter their crop specifics into the on-line calculator to compare the impact of different pesticides. The website has been updated and new pesticides are added as products and data become available, so this tool can continue to serve growers

Justification:
Integrated Pest Management is a strategy that uses a combination of methods (sampling, thresholds, forecasts, biological and cultural controls, etc.) to manage pests without solely relying on pesticides to produce a safe, economic crop. If other control measures are not effective in preventing pest damage, a synthetic chemical pesticide is recommended. In past IPM programs, pesticides were generally chosen based on their efficacy or cost rather than on their potential environmental impact. Although some growers and pest management practitioners did take into account the effect of the pesticides on the applicator or beneficial natural enemies when making pesticide recommendations, no formal method was available to assist them in making environmentally based pesticide choices. Because there was no easy method to assess pesticide impacts, each individual had to rely primarily on their own judgment to make these decisions. Some growers (organic certified) felt that only natural pesticides should be used in agricultural production systems because they are perceived to be less harmful to the environment. Other growers felt that any pesticide registered by the United States Environmental Protection Agency (US EPA) and used according to the label must be environmentally safe. In addition, IPM programs throughout the country use various methods (number of sprays, the amount of active ingredient or formulated product used per acre, dosage equivalents, etc.) to quantify pesticide use and environmental impact to compare different pest management strategies or programs. None of these methods estimates the environmental impact of specific pesticides.

During the EPA pesticide registration process, a wealth of toxicological and environmental impact data is generated. However, these data are not readily available or organized in a manner that is usable to the IPM practitioner. The EIQ puts environmental impact information for pesticides into a usable form to help growers and other IPM practitioners make more environmentally sound pesticide choices. The values obtained from the EIQ calculator can be used to compare different pesticides and pest management programs to ultimately determine which program or pesticide is likely to have the lower impact.

Procedures:

Established in 1992, the EIQ has been a useful tool for IPM practitioners for 22 years. In 2014 a transition occurred as the originators of the EIQ retired and a new curator was named. Brian Eshenaur, a senior extension associate with the IPM program, took over the reigns at the beginning of 2014.

Extensive data are available on the environmental effects of specific pesticides, and the data used in this project were gathered from a variety of sources. These include the pesticide product label, industry and independent product research results, and the European Pesticide Property Database, which is a comprehensive database of pesticide physicochemical and ecotoxicological data.

Factors such as toxicity (dermal, bird, chronic, bee, fish, beneficial insects), soil half-life, leaching potential, plant surface half-life, surface loss potential, and farm worker, consumer, and ecological effects are all considered when calculating an EIQ for a particular pesticide. The result is a single number describing the EIQ of a pesticide active ingredient. Although the model was developed for food crops, for non-food crops the "farm worker" component can be considered equivalent to applicators and the "consumer" component to the end users who purchase the plants.

Once an EIQ value has been established for the active ingredient of a pesticide, EIQ field use ratings (EIQ-FUR) can be calculated. To compare pesticides and pest management strategies, the dose, the formulation or percent active ingredient of the product, and the frequency of application of each pesticide need to be considered. The EIQ-FUR was developed to account for different formulations of the same active ingredient and different use patterns. This rating is calculated by multiplying the EIQ value for the specific chemical by the percent active ingredient in the formulation and by the rate used, usually in pints or pounds of formulated product per acre.

EIQ Field Use Rating (EIQ FUR) = EIQ x % Active Ingredient x Rate

The lower the EIQ-FUR, the lower the environmental impact. This method allows comparisons of the environmental impact among pesticides and different pest management programs. Pesticides should be compared based on the EIQ-FUR of the product only, not by the base EIQ of the active ingredient. As an example, if several pesticides are registered against a particular pest, which pesticide has the least impact on the environment as it is actually applied?

The EIQ Field Use Rating can be used to compare different pest management strategies, and to compare totals for each crop cycle. To do so, calculate the EIQ-FUR for each application made or planned for the whole crop cycle and simply sum them up. By using the EIQ model, it becomes possible for IPM practitioners to easily estimate the environmental impact of different pesticides combinations and choices.

The EIQ Calculator tool is available at the NYS IPM Program website, https://nysipm.cornell.edu/eiq/calculator-field-use-eiq . It makes comparison easy regardless of the units of weight, volume or area being used.

Results and Discussion:

Website work is ongoing to keep the EIQ current. In 2017 new products were added to the pesticide product table and to the EIQ calculator.

EIQ information is accessed through the NYS IPM website. Analytics for the EIQ site indicate there were 45,293 total pageviews and 20,138 unique pageviews for 2017. Along with the NYS IPM website migration a new look was established for the EIQ pages. The new pages have a simplified format and are easier to navigate to the most used features.

In September of 2017 a presentation was delivered to Rochester Institute of Technology's School of Chemical and Material Science that included information on the EIQ. This apparently resulted in a in a single day spike of almost 600 page views for the EIQ calculator.

In 2017 over 20 inquiries were fielded from researchers and practitioners using the EIQ. The majority of those were from the USA and NY but other countries who have corresponded with us this year regarding the EIQ include: Argentina, China, Ecuador, France, Mexico Peru and Spain.

Two press mentions of the use of EIQ as an environmental quality measure occurred in 2017.

- Colorado: http://www.dailycamera.com/columnists/ci_30968573/mara-abbott-multigenerational-farmers-an-endangered-species
- South Africa: http://www.freshfruitportal.com/news/2017/04/06/south-africa-zz2-nature-farming-takes-compost-new-level/

Pest: any insect pest, any disease pest, any weed pest
Setting: agricultural
Management Technique: environmental impact quotient, monitoring, research & education